

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
SEQUENCE LISTING

<110> Watkins, Jeffry Dean  
Pancook, James David

<120> Butyrylcholinesterase Variants That Alter the Activity of  
Chemotherapeutic Agents

<130> X16700

<140> PCT/US 03/038684  
<141> 2003-12-04

<150> US 10/310,666  
<151> 2002-12-04

<150> US 60/509,072  
<151> 2002-12-04

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<170> PatentIn version 3.3

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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<223> Synthetic butyrylcholinesterase variant

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg

225                   X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Gln Ser Val  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser

Cys' Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Ser Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <223> L286H

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro His Ser Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<212> PRT

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<223> Synthetic butyrylcholinesterase variant

x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <223> F227A

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Ala Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Trp Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Ala Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Xaa Val  
275 280 285

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys

530 X16700B\_US seq list revised Natl 12May2005.ST25.txt  
535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 15  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360  
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctctgggtga aagagttatt 420  
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag cttttgggtg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
attctgcaaa gtggttccgc gaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840  
ccctatggga ctcttttggg tgtaaaacttt ggtccgaccg tggatgggtga ttttctcact 900  
gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttgggtgggt 960  
gttaataaag atgaaggac atgggttttta gtcattgggtg ctcttggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080  
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140  
agacctgaaa actaccgtga ggccttgggt gatgttgttg gggattataa tttcatatgc 1200  
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt ttttactat 1260  
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320

X16700B\_US seq list revised Natl 12May2005.ST25.txt

gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500  
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560  
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620  
tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680  
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 16  
<211> 574  
<212> PRT  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<220>  
<221> VARIANT  
<222> (227)..(227)  
<223> F227A

<220>  
<221> VARIANT  
<222> (287)..(287)  
<223> S287G

<220>  
<221> VARIANT  
<222> (328)..(328)  
<223> A328W

<220>  
<221> VARIANT  
<222> (332)..(332)  
<223> Y332M

<400> 16

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Ala Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Gly Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Trp Phe Leu Val Met Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

x16700B\_US seq list revised Nat1 12May2005.ST25.txt

<210> 17  
 <211> 711  
 <212> DNA  
 <213> Mus sp.

<220>  
 <221> misc\_feature  
 <222> (1)..(711)  
 <223> Mouse anti-EGFR antibody variable light chain

<400> 17  
 atggacatga ggggtccccgc tcagctcctg gggctcctgc tgctctggct cccaggtgcc 60  
 aaatgtgaca tcttgctgac tcagtcctca gtcctcctgt ctgtgagtcc aggagaaaga 120  
 gtcagtttct cctgcagggc cagtcagagt attggcacia acatacactg gtatcagcaa 180  
 agaacaaatg gttctccaag gcttctcata aagtatgctt ctgagtctat ctctgggatc 240  
 ccttccaggt ttagtggcag tggatcaggg acagatttta ctcttagcat caacagtgtg 300  
 gagtctgaag atattgcaga ttattactgt caacaaaata ataactggcc aaccacgttc 360  
 ggtgctggga ccaagctgga gctgaaacga actgtggctg caccatctgt cttcatcttc 420  
 ccgccatctg atgagcagtt gaaatctgga actgcctctg ttgtgtgcct gctgaataac 480  
 ttctatccca gagaggccaa agtacagtgg aagggtggata acgccctcca atcgggtaac 540  
 tcccaggaga gtgtcacaga gcaggacagc aaggacagca cctacagcct cagcagcacc 600  
 ctgacgctga gcaaagcaga ctacagaaaa cacaaagtct acgcctgcga agtcacccat 660  
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<210> 18  
 <211> 236  
 <212> PRT  
 <213> Mus sp.

<220>  
 <221> MISC\_FEATURE  
 <222> (1)..(236)  
 <223> Mouse anti-EGFR antibody variable light chain

<400> 18  
 Met Asp Met Arg Val Pro Ala Gln Leu Leu Gly Leu Leu Leu Leu Trp  
 1 5 10 15  
 Leu Pro Gly Ala Lys Cys Asp Ile Leu Leu Thr Gln Ser Pro Val Ile  
 20 25 30  
 Leu Ser Val Ser Pro Gly Glu Arg Val Ser Phe Ser Cys Arg Ala Ser  
 35 40 45

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gln Ser Ile Gly Thr Asn Ile His Trp Tyr Gln Gln Arg Thr Asn Gly  
50 55 60

Ser Pro Arg Leu Leu Ile Lys Tyr Ala Ser Glu Ser Ile Ser Gly Ile  
65 70 75 80

Pro Ser Arg Phe Ser Gly Ser Gly Ser Gly Thr Asp Phe Thr Leu Ser  
85 90 95

Ile Asn Ser Val Glu Ser Glu Asp Ile Ala Asp Tyr Tyr Cys Gln Gln  
100 105 110

Asn Asn Asn Trp Pro Thr Thr Phe Gly Ala Gly Thr Lys Leu Glu Leu  
115 120 125

Lys Arg Thr Val Ala Ala Pro Ser Val Phe Ile Phe Pro Pro Ser Asp  
130 135 140

Glu Gln Leu Lys Ser Gly Thr Ala Ser Val Val Cys Leu Leu Asn Asn  
145 150 155 160

Phe Tyr Pro Arg Glu Ala Lys Val Gln Trp Lys Val Asp Asn Ala Leu  
165 170 175

Gln Ser Gly Asn Ser Gln Glu Ser Val Thr Glu Gln Asp Ser Lys Asp  
180 185 190

Ser Thr Tyr Ser Leu Ser Ser Thr Leu Thr Leu Ser Lys Ala Asp Tyr  
195 200 205

Glu Lys His Lys Val Tyr Ala Cys Glu Val Thr His Gln Gly Leu Ser  
210 215 220

Ser Pro Val Thr Lys Ser Phe Asn Arg Gly Glu Cys  
225 230 235

<210> 19

<211> 2349

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> misc\_feature

<222> (1)..(2349)

<223> Mouse anti-EGFR antibody variable heavy chain and constant heavy chain hinge region of L530

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<400> 19
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tgcacagtct ctggtttctc attaactaac tatggtgtac actgggttcg ccagtctcca      180
ggaaagggtc tggagtggct gggagtgata tggagtgggt gaaacacaga ctataatata      240
cctttcacat ccagactgag catcaacaag gacaattcca agagccaagt tttctttaa      300
atgaacagtc tgcaatctaa tgacacagcc atatattact gtgccagagc cctcacctac      360
tatgattacg agtttgctta ctggggccaa gggactcttg tactgtctc tgcagcctcc      420
accaagggcc catcggctct ccccttgga cctcctcca agagcacctc tgggggcaca      480
gcggccctgg gctgcctggt caaggactac ttcccgaac cggtgacggt gtcgtggaac      540
tcaggcggcc tgaccagcgg cgtgcacacc ttcccgctg tcctacagtc ctcaggactc      600
tactccctca gcagcgtggt gaccgtgccc tccagcagct tgggcacca gacctacatc      660
tgcaacgtga atcacaagcc cagcaacacc aagggtggaca agaaagcaga gcccaaattc      720
tgtgacaaaa ctcacacatg tccaccgtgt ccaaagcttg aagatgacat cataattgca      780
acaaagaatg gaaaagtcag agggatgaac ttgacagttt ttggtggcac ggtaacagcc      840
tttcttgga ttcctatgc acagccacct cttggtagac ttcgattcaa aaagccacag      900
tctctgacca agtggctctga tatttggaat gccacaaaat atgcaaattc ttgctgtcag      960
aacatagatc aaagttttcc aggtttccat ggatcagaga tgtggaacct aaacactgac     1020
ctcagtgaag actgtttata tctaaatgta tggattccag cacctaaacc aaaaaatgcc     1080
actgtattga tatggattta tgggtggtgg tttcaaactg gaacatcatc ttacatgtt     1140
tatgatggca agtttctggc tcgggttgaa agagttattg tagtgtcaat gaactatagg     1200
gtgggtgccc taggattctt agctttgcca ggaaatcctg aggtccagg gaacatgggt     1260
ttatttgatc aacagttggc tcttcagtgg gttcaaaaaa atatagcagc ctttggtgga     1320
aatcctaaaa gtgtaactct ctttgagaaa agtgcaggag cagcttcagt tagcctgcat     1380
ttgctttctc ctggaagcca ttcattgttc accagagcca ttctgcaaag tggttccttt     1440
aatgctcctt gggcggtaac atctctttat gaagctagga acagaacgtt gaacttagct     1500
aaattgactg gttgctctag agagaatgag actgaaataa tcaagtgtct tagaaataaa     1560
gatccccaag aaattcttct gaatgaagca ttgttgtcc cctatgggac tcctttgtca     1620
gtaaactttg gtccgaccgt ggatggtgat tttctactg acatgccaga catattactt     1680
gaacttggac aatttaaaaa aaccagatt ttggtgggtg ttaataaaga tgaagggaca     1740
gcttttttag tctatggtgc tcctggcttc agcaaagata acaatagtat cataactaga     1800
aaagaatttc aggaagggtt aaaaatattt tttccaggag tgagtgagtt tggaaaggaa     1860

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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tccatccttt ttcattacac agactgggta gatgatcaga gacctgaaaa ctaccgtgag 1920
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aagttctcag aatgggggaaa taatgccttt ttctactatt ttgaacaccg atcctccaaa 2040
cttccgtggc cagaatggat gggagtgatg catggctatg aaattgaatt tgtctttggt 2100
ttacctctgg aaagaagaga taattacaca aaagccgagg aaattttgag tagatccata 2160
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acaagctggc ctgtcttcaa aagcactgaa caaaaatatac taaccttgaa tacagagtca 2280
acaagaataa tgacgaaact acgtgctcaa caatgtcgat tctggacatc attttttcca 2340
aaagtctga 2349
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<210> 20
<211> 782
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
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<220>
<221> MISC_FEATURE
<222> (1)..(782)
<223> Mouse anti-EGFR antibody variable heavy chain and constant heavy
chain hinge region of L530
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<400> 20
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Val His Ser Gln Val Gln Leu Lys Gln Ser Gly Pro Gly Leu Val Gln
20           25           30
```

```
Pro Ser Gln Ser Leu Ser Ile Thr Cys Thr Val Ser Gly Phe Ser Leu
35           40           45
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```
Thr Asn Tyr Gly Val His Trp Val Arg Gln Ser Pro Gly Lys Gly Leu
50           55           60
```

```
Glu Trp Leu Gly Val Ile Trp Ser Gly Gly Asn Thr Asp Tyr Asn Thr
65           70           75           80
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```
Pro Phe Thr Ser Arg Leu Ser Ile Asn Lys Asp Asn Ser Lys Ser Gln
85           90           95
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Val Phe Phe Lys Met Asn Ser Leu Gln Ser Asn Asp Thr Ala Ile Tyr
100          105          110
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Cys Ala Arg Ala Leu Thr Tyr Tyr Asp Tyr Glu Phe Ala Tyr Trp  
115 120 125

Gly Gln Gly Thr Leu Val Thr Val Ser Ala Ala Ser Thr Lys Gly Pro  
130 135 140

Ser Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr  
145 150 155 160

Ala Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr  
165 170 175

Val Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro  
180 185 190

Ala Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr  
195 200 205

Val Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn  
210 215 220

His Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Ala Glu Pro Lys Ser  
225 230 235 240

Cys Asp Lys Thr His Thr Cys Pro Pro Cys Pro Lys Leu Glu Asp Asp  
245 250 255

Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met Asn Leu Thr  
260 265 270

Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro Tyr Ala Gln  
275 280 285

Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser Leu Thr Lys  
290 295 300

Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln  
305 310 315 320

Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu Met Trp Asn  
325 330 335

Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ile  
340 345 350

Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp Ile Tyr Gly

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 355 360 365

Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr Asp Gly Lys  
 370 375 380

Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met Asn Tyr Arg  
 385 390 395 400

Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro Glu Ala Pro  
 405 410 415

Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln Trp Val Gln  
 420 425 430

Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val Thr Leu Phe  
 435 440 445

Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu Leu Ser Pro  
 450 455 460

Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser Gly Ser Phe  
 465 470 475 480

Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg Asn Arg Thr  
 485 490 495

Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn Glu Thr Glu  
 500 505 510

Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile Leu Leu Asn  
 515 520 525

Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val Asn Phe Gly  
 530 535 540

Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp Ile Leu Leu  
 545 550 555 560

Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly Val Asn Lys  
 565 570 575

Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly Phe Ser Lys  
 580 585 590

Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu Gly Leu Lys  
 595 600 605

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser Ile Leu Phe  
 610 615 620

His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn Tyr Arg Glu  
 625 630 635 640

Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys Pro Ala Leu  
 645 650 655

Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala Phe Phe Tyr  
 660 665 670

Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu Trp Met Gly  
 675 680 685

Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu Pro Leu Glu  
 690 695 700

Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser Arg Ser Ile  
 705 710 715 720

Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro Asn Glu Thr  
 725 730 735

Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr Glu Gln Lys  
 740 745 750

Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr Lys Leu Arg  
 755 760 765

Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys Val  
 770 775 780

<210> 21  
 <211> 1722  
 <212> DNA  
 <213> Homo sapiens

<220>  
 <221> misc\_feature  
 <222> (1)..(1722)  
 <223> Human butyrylcholinesterase

<400> 21  
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 tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120  
 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180  
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctctgggtga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttgggtg aaatcctaaa agtgtaactc tctttggaga aagtcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttcctt taatgctcct tgggcggtaa catctcttta tgaagctagg	720
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atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgtgtc	840
ccctatggga ctctttgtc agtaaacctt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttgggtggg	960
gttaataaag atgaaggagc agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
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 <213> Homo sapiens

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 <223> Human butyrylcholinesterase

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Phe Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

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275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

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305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
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 <213> Artificial

<220>  
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<220>  
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 <223> N68K

<220>  
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 <223> Xaa = Ala

<400> 24

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			20				25						30		

Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
		35				40						45			

Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
	50					55					60				

Cys	Cys	Gln	Lys	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
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65	X16700B_US seq list revised										Nat'l 12May2005.ST25.txt										80
	70										75										
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Ile	Tyr	Gly 115	Gly	Gly	Phe	Gln	Thr 120	Gly	Thr	Ser	Ser	Leu 125	His	Val	Tyr						
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Trp	Val	Gln	Lys 180	Asn	Ile	Ala	Ala	Phe 185	Gly	Gly	Asn	Pro	Lys 190	Ser	Val						
Thr	Leu	Phe 195	Gly	Glu	Ser	Ala	Gly 200	Ala	Ala	Ser	Val	Ser 205	Leu	His	Leu						
Leu	Ser 210	Pro	Gly	Ser	His	Ser 215	Leu	Phe	Thr	Arg	Ala 220	Ile	Leu	Gln	Ser						
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Ile 305	Leu	Leu	Glu	Leu	Gly 310	Gln	Phe	Lys	Lys	Thr 315	Gln	Ile	Leu	Val	Gly 320						

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
                   340                                  345                                  350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
                   355                                  360                                  365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                   370                                  375                                  380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
                   385                                  390                                  395                                  400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                                   420                                  425                                  430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
                   435                                  440                                  445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                   515                                  520                                  525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                   530                                  535                                  540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

<210> 25  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<223> N68R

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Arg Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
 275 280 285  
 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300  
 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320  
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335  
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350  
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365  
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380  
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<220>  
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<220>  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 20 25 30

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Gly Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile His Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln

545 x16700B\_US seq list revised Natl 12May2005.ST25.txt 550 555 560

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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370 X16700B\_US seq list revised Natl 12May2005.ST25.txt 380

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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Page 59

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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115 120 125

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130 135 140

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145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

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180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 37  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<210> 38
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<220>
<223> Synthetic butyrylcholinesterase variant

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<400> 38

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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Gly Gly Thr Pro Leu Ser Val  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Asn Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

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<212> DNA  
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<220>  
<223> Synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag cctttggtgg aaatcctaaa agtgttaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc 660  
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aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttggtgtc 840  
ccctatggga accctttgtc agtaaacttt ggtccgaccg tggatggtga ttttctcact 900  
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaaggtt taaaaatatt tttccagga 1080

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat 1320
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<210> 44  
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 <213> Artificial

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<220>  
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 <222> (284)..(284)  
 <223> T284N

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Asn Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<210> 45  
<211> 1722

<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtgg ttttcaaact 360  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
aacagaacgt tgaacttagc taaattgact gggtgtctta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840  
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gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260  
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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<220>  
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<220>  
 <221> VARIANT  
 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
 <221> VARIANT  
 <222> (300)..(300)  
 <223> T300P

<400> 46

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

145                   X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
                                   180                                   185                                   190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
                                   195                                   200                                   205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
                                   210                                   215                                   220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
                                   225                                   230                                   235                                   240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
                                   245                                   250                                   255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
                                   260                                   265                                   270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
                                   275                                   280                                   285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Pro Asp Met Pro Asp  
                                   290                                   295                                   300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
                                   305                                   310                                   315                                   320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
                                   325                                   330                                   335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
                                   340                                   345                                   350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
                                   355                                   360                                   365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                                   370                                   375                                   380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                     420                    425                    430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
                     435                    440                    445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
                     450                    455                    460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
                     465                    470                    475                    480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                     485                    490                    495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                     500                    505                    510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                     515                    520                    525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                     530                    535                    540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
                     545                    550                    555                    560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaaact	360
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ccctatgggc	gtcctttgtc	agtaaaactt	ggtccgaccg	tggatggtga	ttttctcact	900
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gttaataaag	atgaagggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
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gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
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tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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 <213> Artificial

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<220>  
 <221> VARIANT  
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 <223> Xaa = Ala

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<221> VARIANT

<222> (284)..(284)

<223> T284R

<400> 48

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20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Arg Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
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aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <213> Artificial

<220>  
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Ser Pro Leu Ser Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Ser Asp Met Pro Asp  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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<223> Xaa = Ala

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Tyr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser

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485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<223> synthetic butyrylcholinesterase variant

<400> 55  
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cctgccttgg agttcacaa gaagttctca gaatggggaa ataatgcctt ttttactat	1260
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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 <213> Artificial

<220>  
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<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
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 50 55 60  
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95  
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110  
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125  
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140  
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160  
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175  
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190  
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255  
 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 57  
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gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 58  
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 <212> PRT  
 <213> Artificial

<220>  
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<220>  
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 <223> Xaa = Ala

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 <223> L286A

<400> 58

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Asn	Leu	Thr	Val	Phe	Gly	Gly	Thr	Val	Thr	Ala	Phe	Leu	Gly	Ile	Pro
			20					25					30		

Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
		35					40					45			

Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
	50					55					60				

Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
65					70					75					80

Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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130 135 140

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145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Ala Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
           370                                  375                                  380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
           385                                  390                                  395                                  400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                                   405                                  410                                  415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                                   420                                  425                                  430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
           435                                  440                                  445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
           450                                  455                                  460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                                   500                                  505                                  510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
           515                                  520                                  525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
           530                                  535                                  540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
           545                                  550                                  555                                  560

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag      240
atgtggaacc caaactactga cctcagtga gactgtttat atctaaatgt atggattcca      300
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aatatagcag cttttggtgg aaatcctaaa agtgtaactc tctttggaga aagtcagga      600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc      660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg      720
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ccctatggga ctcttggtgc agtaaaactt ggtccgaccg tggatggtga ttttctcact      900
gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt      960
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gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag     1140
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga      1560
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa      1680
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<210> 60  
<211> 574

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<212> PRT  
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<223> Xaa = Ala

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<223> L286G

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

X167008\_US seq list revised Natl 12May2005.ST25.txt  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
           195                          200                          205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
           210                          215                          220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Gly Ser Val  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
           370                          375                          380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
   385                          390                          395                          400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                           405                          410                          415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<210> 62
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala

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<221> VARIANT
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<223> L286K

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<400> 62

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45  
 Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60  
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95  
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110  
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125  
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140  
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160  
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175  
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190  
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Lys Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 63  
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<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 63  
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
ggaacatcat ctttcatgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420  
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag ctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660  
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
aacagaacgt tgaacttagc taaattgact gggtgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgtgtc 840  
ccctatggga ctctatgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact 900  
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
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<210> 64  
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 <213> Artificial

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 <223> L286M

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Met Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

<211> 1722

<212> DNA

<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag ctttgggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctaattc agtaaaactt ggtccgaccg tggatggtga tttctcact	900
gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttgggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttgttg gggattataa tttcatatgc	1200
cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
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gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc

1722

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<223> L286N

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Asn Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<211> 1722

<212> DNA

<213> Artificial

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<223> Synthetic butyrylcholinesterase variant

<400> 67

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240

atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
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ccctatggga ctctcgttc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<223> L286R

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg



X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                   500                                  505                                  510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                   515                                  520                                  525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                   530                                  535                                  540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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 cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180  
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
 gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
 ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420  
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 gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaaatga gactgaaata 780  
 atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttggtgtc 840  
 ccctatggga ctctttgtt tgtaaaactt ggtccgaccg tggatggtga ttttctcact 900

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 70  
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 <212> PRT  
 <213> Artificial

<220>  
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<220>  
 <221> VARIANT  
 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (287)..(287)  
 <223> S287F

<400> 70

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser

50 x16700B\_US seq list revised Natl 12May2005.ST25.txt 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Phe Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 71  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg ttattttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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gcagcttcag ttagcctgca ttgtctttct cctggaagcc attcattgtt caccagagcc 660  
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aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840  
ccctatggga ctcttttga tgtaaaactt ggtccgaccg tggatgggtga ttttctcact 900  
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gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680  
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<210> 72  
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 <212> PRT  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (287)..(287)  
 <223> S287H

<400> 72

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu His Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 73  
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<220>  
<223> Synthetic butyrylcholinesterase variant

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
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ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
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<210> 74

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (287)..(287)  
 <223> S287R

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

X167008\_US seq list revised Natl 12May2005.ST25.txt

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Arg Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 75  
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<220>  
<223> synthetic butyrylcholinesterase variant

<400> 75  
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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
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ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420  
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc 660  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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gacatgccag acatattact tgaacttggga caatttataa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat cttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
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<210> 76  
 <211> 574  
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<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (287)..(287)  
 <223> S287T

<400> 76

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Thr Val  
275 280 285

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys

530 X16700B\_US seq list revised Natl 12May2005.ST25.txt 535 540

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Ala Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 79  
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<220>  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa      180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag      240
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa      540
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<223> T327P

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Pro Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                                   485                                  490                                  495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                                   515                                  520                                  525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
           530                                  535                                  540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Leu Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

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500 505 510

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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565 570

<210> 83  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt 960  
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aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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<210> 84
<211> 574
<212> PRT
<213> Artificial

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<220>
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<223> Xaa = Ala

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Ser Val Tyr Gly Ala Pro Gly  
325 330 335

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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<210> 85  
<211> 1722

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 85

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atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc	840
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gttaataaag atgaaggac agctttttta gcgtatggtg ctctggctt cagcaaagat	1020
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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1722

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 <223> Xaa = Ala

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45  
 Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60  
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
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 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Gly Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<210> 90
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<223> Xaa = Ala

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<223> V331P

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<400> 90

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50          55          60

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
Page 165

305                   X16700B\_US seq list revised Natl 12May2005.ST25.txt  
                                   310                                   315                                   320

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                                   340                                   345                                   350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                                   370                                   375                                   380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
                                   385                                   390                                   395                                   400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                                   405                                   410                                   415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                                   420                                   425                                   430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
                                   435                                   440                                   445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
                                   465                                   470                                   475                                   480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                                   485                                   490                                   495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                                   500                                   505                                   510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                                   515                                   520                                   525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                                   530                                   535                                   540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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<223> Synthetic butyrylcholinesterase variant

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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 Page 168

130 X16700B\_US seq list revised Natl 12May2005.ST25.txt 135 140

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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ser Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 225 230 235 240  
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 245 250 255  
 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270  
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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 290 295 300  
 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Thr Tyr Gly Ala Pro Gly  
 325 330 335  
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350  
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365  
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380  
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400  
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415  
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 420 425 430  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
                           85                          90                          95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Ala Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Gly Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Leu Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Page 184

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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 <223> Synthetic butyrylcholinesterase variant

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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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 gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360  
 ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctctgggtga aagagttatt 420  
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
 aatatagcag cctttgggtg aaatcctaaa agtgtaaact tctttggaga aagtgcagga 600  
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 aacagaacgt tgaacttagc taaattgact gggtgtctta gagagaatga gactgaaata 780  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Trp Gly Ala Pro Gly  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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X167008\_US seq list revised Natl 12May2005.ST25.txt  
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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270  
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
 275 280 285  
 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300  
 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320  
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335  
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380  
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400  
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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<212> DNA

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<223> Synthetic butyrylcholinesterase variant

<400> 107

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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360

ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<223> Synthetic butyrylcholinesterase variant

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<223> Xaa = Ala

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&lt;400&gt; 108

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Leu Trp Pro Glu  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Gln Trp Pro Glu  
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435 440 445

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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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195 200 205

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210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
Page 206

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Phe	Phe	Tyr	Tyr 420	Phe	Glu	His	Arg	Ser 425	Ser	Lys	Leu	Arg	Trp 430	Pro	Glu
Trp	Met	Gly 435	Val	Met	His	Gly	Tyr 440	Glu	Ile	Glu	Phe	Val 445	Phe	Gly	Leu
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys
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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Thr Trp Pro Glu
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
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atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840  
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gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Val Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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<212> DNA

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<223> Synthetic butyrylcholinesterase variant

<400> 119

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Met Pro Glu  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Tyr Pro Glu  
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Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

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gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaagggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttccagga 1080  
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
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tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
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<210> 124
<211> 574
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
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<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala
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<222> (431)..(431)
<223> P431Q
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20 25 30
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35 40 45
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50 55 60
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
65 70 75 80
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85 90 95
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Gln Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
 565 570

<210> 125  
 <211> 1722  
 <212> DNA  
 <213> Artificial

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 125

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact	360
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
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aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctcttttgtc agtaaaacttt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttggc caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaggga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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cctgccttgg agttcaccaa gaagtctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaaggga tgggagtgat gcatggctat	1320
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<210> 126  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
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 <221> VARIANT  
 <222> (227)..(227)  
 <223> Xaa = Ala

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 <222> (433)..(433)  
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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln

X167008\_US seq list revised Natl 12May2005.ST25.txt  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Gly Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 127  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> synthetic butyrylcholinesterase variant

<400> 127  
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180  
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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcgggttga aagagttatt 420

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc	660
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
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ccctatggga ctctttgtc agtaaaactt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttggg caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat	1020
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tttgaacacc gatcctcaa acttccgtgg ccagaatggt ttggagtgat gcatggctat	1320
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
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tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 128  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
 <223> synthetic butyrylcholinesterase variant

<220>  
 <221> VARIANT  
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<220>  
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 <222> (434)..(434)  
 <223> M434F

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<400> 128

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45  
Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60  
Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80  
Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95  
Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110  
Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125  
Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140  
Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160  
Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175  
Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190  
Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205  
Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220  
Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

X167008\_US seq list revised Natl 12May2005.ST25.txt  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
                   245                                  250                                  255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
                   260                                  265                                  270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
                   275                                  280                                  285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
                   290                                  295                                  300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
                   305                                  310                                  315                                  320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
                                   325                                  330                                  335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
                   340                                  345                                  350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
                   355                                  360                                  365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                   370                                  375                                  380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
                   385                                  390                                  395                                  400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                                   405                                  410                                  415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                   420                                  425                                  430

Trp Phe Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
                   435                                  440                                  445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
                   450                                  455                                  460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
                   465                                  470                                  475                                  480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                   485                                  490                                  495

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 129  
<211> 1722  
<212> DNA  
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<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 129  
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtgg ttttcaaact 360  
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aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgtgtc 840  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 agacctgaaa actaccgtga ggccttggt gatgttggtt gggattataa tttcatatgc 1200  
 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260  
 tttgaacacc gatcctccaa acttccgtgg ccagaatggg ggggagtgat gcatggctat 1320  
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu	65	70	75	80
Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn	85	90	95	
Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp	100	105	110	
Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr	115	120	125	
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met	130	135	140	
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro	145	150	155	160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln	165	170	175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val	180	185	190	
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu	195	200	205	
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser	210	215	220	
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg	225	230	235	240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn	245	250	255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile	260	265	270	
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val	275	280	285	
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp	290	295	300	
Ile	Leu	Leu	Glu	Leu	Gly	Gln	Phe	Lys	Lys	Thr	Gln	Ile	Leu	Val	Gly	305	310	315	320

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Gly Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 <223> M434K

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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 165 170 175  
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190  
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270  
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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 Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320  
 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335  
 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350  
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365  
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380  
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Lys Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 133

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> synthetic butyrylcholinesterase variant

<400> 133

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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

<223> xaa = Ala

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<221> VARIANT

<222> (434)..(434)

<223> M434L

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20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Leu Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro



X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<220>
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<222> (227)..(227)
<223> Xaa = Ala

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
20           25           30

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
35           40           45

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95  
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110  
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125  
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140  
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160  
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175  
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190  
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255  
 Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270  
 Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
 275 280 285  
 Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 Page 250

290 X16700B\_US seq list revised Natl 12May2005.ST25.txt 295 300

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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Asn Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<223> Synthetic butyrylcholinesterase variant

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gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Ser Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 139  
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 <213> Artificial

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 <223> Xaa = Ala

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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Trp Trp Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X167008\_US seq list revised Natl 12May2005.ST25.txt

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Cys Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
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Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
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Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
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Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<210> 143  
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<400> 143  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
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Trp Met Gly Val Gly His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

<220>

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X167008\_US seq list revised Natl 12May2005.ST25.txt

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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu

Trp Met Gly Val Ile His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

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gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
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 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
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Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
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Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn

X167008\_US seq list revised Natl 12May2005.ST25.txt  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
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Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Thr Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495



x167008\_US seq list revised Natl 12May2005.ST25.txt

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Tyr	Ala	Gln	Pro	Pro	Leu	Gly	Arg	Leu	Arg	Phe	Lys	Lys	Pro	Gln	Ser
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Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu

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Trp	Val	Gln	Lys 180	Asn	Ile	Ala	Ala	Phe 185	Gly	Gly	Asn	Pro	Lys 190	Ser	Val	
Thr	Leu	Phe 195	Gly	Glu	Ser	Ala	Gly 200	Ala	Ala	Ser	Val	Ser 205	Leu	His	Leu	
Leu	Ser 210	Pro	Gly	Ser	His	Ser 215	Leu	Phe	Thr	Arg	Ala 220	Ile	Leu	Gln	Ser	
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X167008\_US seq list revised Natl 12May2005.ST25.txt  
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Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Ala Glu Ile Glu Phe Val Phe Gly Leu  
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Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<211> 574

<212> PRT

<213> Artificial

<220>

<223> synthetic butyrylcholinesterase variant

<220>

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<223> Xaa = Ala

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<222> (440)..(440)

<223> Y440E

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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
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Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
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 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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 Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
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 Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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 Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
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 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Glu Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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<211> 1722

<212> DNA

<213> Artificial

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<223> synthetic butyrylcholinesterase variant

<400> 153

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180

tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
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<210> 154

<211> 574

<212> PRT

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<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

x16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <223> Y440F

<400> 154

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
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Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
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Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Phe Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
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Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<223> Synthetic butyrylcholinesterase variant

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <223> Xaa = Ala

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 <223> Y440G

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
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Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Gly Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln

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<210> 157  
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 <223> Synthetic butyrylcholinesterase variant

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 <223> Xaa = Ala

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 <223> Y440H

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn

370 X167008\_US seq list revised Natl 12May2005.ST25.txt 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly His Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	caactgtattg	atatggattt	atgggtgggg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	gggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
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gaaattttga	gtagatccat	agtgaacg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
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<210> 160

<211> 574

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<213> Artificial

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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 <223> Y440L

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Leu Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 161  
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<220>  
 <223> Synthetic butyrylcholinesterase variant

<400> 161  
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 aatatagcag cctttggtgg aaatcctaaa agtgaactc tctttggaga aagtcagga 600  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gacatgccag	acatattact	tgaacttggg	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaaggagc	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
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35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Met Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<213> Artificial

<220>  
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attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
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gttaataaag atgaaggac agctttttta gtctatggtg ctctggctt cagcaaagat 1020  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<223> Xaa = Ala

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<223> Y440N

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<400> 164

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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
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Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
50          55          60

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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
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Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn
85          90          95

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X167008\_US seq list revised Natl 12May2005.ST25.txt

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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Asn Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 165  
<211> 1722  
<212> DNA  
<213> Artificial

<220>

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 <223> Synthetic butyrylcholinesterase variant

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 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180  
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
 gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360  
 ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420  
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
 aatatagcag ctttgggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
 atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840  
 ccctatggga ctcttttgtc agtaaacctt ggtccgaccg tggatgggtga ttttctcact 900  
 gacatgccag acatattact tgaacttggga caatttaaaa aaaccagat tttggtgggt 960  
 gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
 gtgagtgagt ttggaaagga atccatcctt ttccattaca cagactgggt agatgatcag 1140  
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200  
 cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260  
 tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggccag 1320  
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaaatat 1500  
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560  
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 tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680  
 tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 166

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

<221> VARIANT

<222> (227)..(227)

<223> Xaa = Ala

<220>

<221> VARIANT

<222> (440)..(440)

<223> Y440Q

<400> 166

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Trp Met Gly Val Met His Gly Gln Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 167

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> synthetic butyrylcholinesterase variant

<400> 167

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtgggtgg ttttcaaact	360
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcgggttga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480

X16700B\_US seq list revised Natl 12May2005.ST25.txt

gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg gggtcaaaaa	540
aatatagcag cctttggtag aaatcctaaa agtgttaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtgggtccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctctttgtc agtaaacctt ggtccgaccg tggatgggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatgggtg ctctggctt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggcagg	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat catTTTTTCC aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc	1722

<210> 168  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<220>  
 <221> VARIANT  
 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
 <221> VARIANT  
 <222> (440)..(440)  
 <223> Y440R

<400> 168

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
 20 25 30  
 Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45  
 Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60  
 Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95  
 Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110  
 Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125  
 Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140  
 Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160  
 Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175  
 Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190  
 Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205  
 Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220  
 Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240  
 Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Arg Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 169  
<211> 1722  
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<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 169  
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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
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gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag ctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattggt caccagagcc 660  
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
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atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgtgtgc 840  
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gacatgccag acatattact tgaacttgg caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat 1020  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctct 1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500
ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560
ttctggacat cattttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620
tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680
tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722
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<210> 170
<211> 574
<212> PRT
<213> Artificial
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<220>
<223> Synthetic butyrylcholinesterase variant
```

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<220>
<221> VARIANT
<222> (227)..(227)
<223> Xaa = Ala
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<220>
<221> VARIANT
<222> (440)..(440)
<223> Y440S
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<400> 170
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Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro
          20          25          30
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser
          35          40          45
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```
Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser
          50          55          60
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Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu
          65          70          75          80
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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly

x167008\_US seq list revised Natl 12May2005.ST25.txt  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Ser Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
 565 570

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<210> 171

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 171

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cttcgattca	aaaagccaca	gtctctgacc	aagtgggtctg	atatttggaa	tgccacaaaa	180
tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttcca	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtgggtg	ttttcaaact	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatagcag	cctttgggtg	aaatcctaaa	agtgtaaact	tctttggaga	aagtcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattgtt	caccagagcc	660
attctgcaaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgttgtc	840
ccctatggga	ctcctttgtc	agtaaacttt	ggtccgaccg	tggatgggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttggg	caatttaaaa	aaaccagat	tttgggtggg	960
gttaataaag	atgaagggac	agctttttta	gtctatggtg	ctcctggcct	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagttctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggcact	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620

X167008\_US seq list revised Natl 12May2005.ST25.txt  
 tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680  
 tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc 1722

<210> 172  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<220>  
 <221> VARIANT  
 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (440)..(440)  
 <223> Y440T

<400> 172

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

145                   X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
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Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
                                   180                                   185                                   190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
                                   195                                   200                                   205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
                                   210                                   215                                   220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
                                   225                                   230                                   235                                   240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
                                   245                                   250                                   255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
                                   260                                   265                                   270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
                                   275                                   280                                   285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
                                   290                                   295                                   300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
                                   305                                   310                                   315                                   320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
                                   325                                   330                                   335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
                                   340                                   345                                   350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
                                   355                                   360                                   365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                                   370                                   375                                   380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                     405                    410                    415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                     420                    425                    430

Trp Met Gly Val Met His Gly Thr Glu Ile Glu Phe Val Phe Gly Leu  
                     435                    440                    445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
                     450                    455                    460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
                     465                    470                    475                    480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                     485                    490                    495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                     500                    505                    510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                     515                    520                    525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                     530                    535                    540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
                     545                    550                    555                    560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
                     565                    570

<210> 173  
 <211> 1722  
 <212> DNA  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<400> 173  
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 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180  
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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gtagtgt	caa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctc	cag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagtg	ggttcaaaaa	540
aatatag	cag	cctttgggtg	aaatcctaaa	agtgtaaactc	tctttggaga	aagtgcagga	600
gcagctt	cag	ttagcctgca	tttgctttct	cctggaagcc	attcattgtt	caccagagcc	660
attctgc	aaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaac	gt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagt	gtc	ttagaaataa	agatcccaa	gaaattcttc	tgaatgaagc	atttgtgtgc	840
ccctatg	gga	ctcctttgtc	agtaaaacttt	ggtccgaccg	tggatgggtga	ttttctcact	900
gacatgc	cag	acataattact	tgaacttggg	caatttaaaa	aaaccagat	tttgggtgggt	960
gttaata	aaag	atgaagggac	agctttttta	gtctatggtg	ctcctggctt	cagcaaagat	1020
aacaatag	ta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtga	gt	ttggaaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctga	aaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgcctt	gg	agttcaccaa	gaagttctca	gaatggggaa	ataatgcctt	tttctactat	1260
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gaaatttt	ga	gtagatccat	agtgaacgg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagact	c	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaacctt	ga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggac	at	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtg	ga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 174  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
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<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<221> VARIANT

<222> (441)..(441)

<223> E441T

<400> 174

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Thr Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 175  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 175  
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cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttggaa tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtggtgg ttttcaaact 360  
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gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
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gcagcttcag ttagcctgca ttgtcttct cctggaagcc attcattgtt caccagagcc 660  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
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 gaactggaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
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 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500  
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 ttctggacat cttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620  
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<210> 176  
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 <212> PRT  
 <213> Artificial

<220>  
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<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
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 <222> (442)..(442)  
 <223> I442L

<400> 176

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Leu	Thr	Lys	Trp	Ser	Asp	Ile	Trp	Asn	Ala	Thr	Lys	Tyr	Ala	Asn	Ser
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Cys	Cys	Gln	Asn	Ile	Asp	Gln	Ser	Phe	Pro	Gly	Phe	His	Gly	Ser	Glu
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Met	Trp	Asn	Pro	Asn	Thr	Asp	Leu	Ser	Glu	Asp	Cys	Leu	Tyr	Leu	Asn
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Val	Trp	Ile	Pro	Ala	Pro	Lys	Pro	Lys	Asn	Ala	Thr	Val	Leu	Ile	Trp
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Ile	Tyr	Gly	Gly	Gly	Phe	Gln	Thr	Gly	Thr	Ser	Ser	Leu	His	Val	Tyr
		115					120					125			
Asp	Gly	Lys	Phe	Leu	Ala	Arg	Val	Glu	Arg	Val	Ile	Val	Val	Ser	Met
	130					135					140				
Asn	Tyr	Arg	Val	Gly	Ala	Leu	Gly	Phe	Leu	Ala	Leu	Pro	Gly	Asn	Pro
145					150					155					160
Glu	Ala	Pro	Gly	Asn	Met	Gly	Leu	Phe	Asp	Gln	Gln	Leu	Ala	Leu	Gln
				165					170					175	
Trp	Val	Gln	Lys	Asn	Ile	Ala	Ala	Phe	Gly	Gly	Asn	Pro	Lys	Ser	Val
			180					185					190		
Thr	Leu	Phe	Gly	Glu	Ser	Ala	Gly	Ala	Ala	Ser	Val	Ser	Leu	His	Leu
		195					200					205			
Leu	Ser	Pro	Gly	Ser	His	Ser	Leu	Phe	Thr	Arg	Ala	Ile	Leu	Gln	Ser
	210					215					220				
Gly	Ser	Xaa	Asn	Ala	Pro	Trp	Ala	Val	Thr	Ser	Leu	Tyr	Glu	Ala	Arg
225					230					235					240
Asn	Arg	Thr	Leu	Asn	Leu	Ala	Lys	Leu	Thr	Gly	Cys	Ser	Arg	Glu	Asn
				245					250					255	
Glu	Thr	Glu	Ile	Ile	Lys	Cys	Leu	Arg	Asn	Lys	Asp	Pro	Gln	Glu	Ile
			260					265					270		
Leu	Leu	Asn	Glu	Ala	Phe	Val	Val	Pro	Tyr	Gly	Thr	Pro	Leu	Ser	Val
		275					280					285			
Asn	Phe	Gly	Pro	Thr	Val	Asp	Gly	Asp	Phe	Leu	Thr	Asp	Met	Pro	Asp
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Leu Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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<210> 177

<211> 1722

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 177

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaagatagat caaagttttc caggcttctt tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtgg ttttcaaact	360
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atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc	840
ccctatggga ctaatttgtc agtaaacttt ggtccgaccg tggatgggtga ttttctcact	900
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gttaataaag atgaaggac agctttttta gcgtatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
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tgggagtggg aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt acactagcaa gaaagaaagt tgtgtggggtc tc	1722

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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Cys Cys Gln Lys Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240  
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 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
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 gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
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 ccctatggga ctaatttgtc agtaaacctt ggtccgaccg tggatggtga ttttctcact 900  
 gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt 960  
 gttaataaag atgaaggac agctttttta gcgtatggtg ctcttggtt cagcaaagat 1020  
 aacaatagta tcataactag aaaagaattt caggaagggt taaaatatt tttccagga 1080  
 gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140  
 agacctgaaa actaccgtga ggccttggt gatgttgtt gggattataa tttcatatgc 1200  
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 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca 1440  
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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 <223> P285N

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 <223> V331A

<400> 180

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

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130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
           370                          375                          380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
           385                          390                          395                          400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                           405                          410                          415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                           420                          425                          430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
           435                          440                          445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
           450                          455                          460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
           465                          470                          475                          480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                           485                          490                          495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                           500                          505                          510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
           515                          520                          525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
           530                          535                          540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
           545                          550                          555                          560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240  
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cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260  
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X167008\_US seq list revised Natl 12May2005.ST25.txt

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<223> H77F

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<223> Xaa = Ala

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<222> (434)..(434)

<223> M434L

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20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
 165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
 180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
 195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
 210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
 225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
 245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
 260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
 275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
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Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt  
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Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Leu Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
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Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
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Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
 565 570

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X16700B_US seq list revised Natl 12May2005.ST25.txt				
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
<223> synthetic butyrylcholinesterase variant

<220>  
<221> VARIANT  
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<223> H77F

<220>  
<221> VARIANT  
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<223> Xaa = Ala

<220>  
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<223> P285N

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<223> V331A

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<222> (429)..(429)  
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1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met

130 x16700B\_US seq list revised Natl 12May2005.ST25.txt  
135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Arg Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
 530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
 545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
 565 570

<210> 185  
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 <212> DNA  
 <213> Artificial

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 <223> Synthetic butyrylcholinesterase variant

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 cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180

X16700B\_US seq list revised Natl 12May2005.ST25.txt

tatgcaaatt	cttgctgtca	gaacatagat	caaagttttc	caggcttctt	tggatcagag	240
atgtggaacc	caaacactga	cctcagtga	gactgtttat	atctaaatgt	atggattcca	300
gcacctaaac	caaaaaatgc	cactgtattg	atatggattt	atggtggtgg	ttttcaatgg	360
ggaacatcat	ctttacatgt	ttatgatggc	aagtttctgg	ctcgggttga	aagagttatt	420
gtagtgtcaa	tgaactatag	ggtgggtgcc	ctaggattct	tagctttgcc	aggaaatcct	480
gaggctccag	ggaacatggg	tttatttgat	caacagttgg	ctcttcagt	ggttcaaaaa	540
aatatagcag	cctttggtgg	aaatcctaaa	agtgtaaact	tctttggaga	aagtgcagga	600
gcagcttcag	ttagcctgca	tttgctttct	cctggaagcc	attcattgtt	caccagagcc	660
attctgcaaa	gtggttccgc	kaatgctcct	tgggcggtaa	catctcttta	tgaagctagg	720
aacagaacgt	tgaacttagc	taaattgact	ggttgctcta	gagagaatga	gactgaaata	780
atcaagtgtc	ttagaaataa	agatccccaa	gaaattcttc	tgaatgaagc	atttgtgtgc	840
ccctatggga	ctaatttgtc	agtaaaacttt	ggtccgaccg	tggatggtga	ttttctcact	900
gacatgccag	acatattact	tgaacttggg	caatttaaaa	aaaccagat	tttggtgggt	960
gttaataaag	atgaagggac	agctttttta	gcgtatggtg	ctcctggctt	cagcaaagat	1020
aacaatagta	tcataactag	aaaagaattt	caggaagggt	taaaaatatt	ttttccagga	1080
gtgagtgagt	ttggaagga	atccatcctt	tttcattaca	cagactgggt	agatgatcag	1140
agacctgaaa	actaccgtga	ggccttgggt	gatgttggtg	gggattataa	tttcatatgc	1200
cctgccttgg	agttcaccaa	gaagttctca	gaatggggaa	ataatgcctt	tttctactat	1260
tttgaacacc	gatcctccaa	acttccgtgg	ccagaatgga	tgggagtgat	gcatggctat	1320
gaaattgaat	ttgtctttgg	tttacctctg	gaaagaagag	ataattacac	aaaagccgag	1380
gaaattttga	gtagatccat	agtgaacg	tgggcaaatt	ttgcaaaata	tgggaatcca	1440
aatgagactc	agaacaatag	cacaagctgg	cctgtcttca	aaagcactga	acaaaaatat	1500
ctaaccttga	atacagagtc	aacaagaata	atgacgaaac	tacgtgctca	acaatgtcga	1560
ttctggacat	cattttttcc	aaaagtcttg	gaaatgacag	gaaatattga	tgaagcagaa	1620
tgggagtgga	aagcaggatt	ccatcgctgg	aacaattaca	tgatggactg	gaaaaatcaa	1680
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<210> 186

<211> 574

<212> PRT

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<220>

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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<223> H77F

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<223> P285N

<220>  
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<222> (331)..(331)  
<223> V331A

<400> 186

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
1 5 10 15

Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Trp Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro

145                   X16700B\_US seq list revised Natl 12May2005.ST25.txt                   150                   155                   160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
                                  165                                   170                                   175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
                                  180                                   185                                   190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
                                  195                                   200                                   205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
                                  210                                   215                                   220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225                                   230                                   235                                   240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
                                  245                                   250                                   255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
                                  260                                   265                                   270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
                                  275                                   280                                   285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
                                  290                                   295                                   300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305                                   310                                   315                                   320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
                                  325                                   330                                   335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
                                  340                                   345                                   350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
                                  355                                   360                                   365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
                                  370                                   375                                   380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385                                   390                                   395                                   400

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
                     405                    410                    415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
                     420                    425                    430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
                     435                    440                    445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
                     450                    455                    460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
                     465                    470                    475                    480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
                     485                    490                    495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
                     500                    505                    510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
                     515                    520                    525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
                     530                    535                    540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
                     545                    550                    555                    560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
                     565                    570

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<220>  
 <223> Synthetic butyrylcholinesterase variant

<400> 187  
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 cttcgattca aaaagccaca gtctctgacc aagtggctctg atatttgga tgccacaaaa 180  
 tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttctt tggatcagag 240  
 atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg tttcaaact 360  
 ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420  
 gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
 gaggtccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
 aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
 gcagcttcag ttagcctgca ttgctttct cctggaagcc attcattgtt caccagagcc 660  
 attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
 aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
 atcaagtgtc ttagaaataa agatcccaa gaaattcttc tgaatgaagc atttgttgtc 840  
 ccctatggga ctaatttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact 900  
 gacatgccag acatattact tgaacttggg caatttataa aaaccagat tttggtgggt 960  
 gttaataaag atgaaggac agctttttta gcgtatggtg ctcttggtt cagcaaagat 1020  
 aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
 gtgagtgagt ttggaaggga atccatcctt tttcattaca cagactgggt agatgatcag 1140  
 agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200  
 cctgccttgg agttcacaa gaagttctca gaatggggaa ataatgcctt tttctactat 1260  
 tttgaacacc gatcctcaa acttccgtgg ccagaatgga tgggagtgat gcatggccag 1320  
 gaaattgaat ttgtctttgg tttacctctg gaaagaagag ataattacac aaaagccgag 1380  
 gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaaata tgggaatcca 1440  
 aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat 1500  
 ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga 1560  
 ttctggacat cttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa 1620  
 tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa 1680  
 tttaacgatt acactagcaa gaaagaaagt tgtgtgggtc tc 1722

<210> 188  
 <211> 574  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<220>  
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 <223> H77F

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<220>  
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 <222> (227)..(227)  
 <223> Xaa = Ala

<220>  
 <221> VARIANT  
 <222> (285)..(285)  
 <223> P285N

<220>  
 <221> VARIANT  
 <222> (331)..(331)  
 <223> V331A

<220>  
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 <222> (440)..(440)  
 <223> Y440Q

<400> 188

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
 145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln

x16700B\_US seq list revised Natl 12May2005.ST25.txt  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

X167008\_US seq list revised Natl 12May2005.ST25.txt  
Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Gln Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 189  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 189  
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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttga aagagttatt 420

X16700B\_US seq list revised Natl 12May2005.ST25.txt

gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa	540
aatatagcag cctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga	600
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc	660
attctgcaaa gtggttcctt taatgctcct tgggcggtaa catctcttta tgaagctagg	720
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata	780
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagt ctttgttgtc	840
ccctatggga ctctcttgtc agtaaaacttt ggtccgaccg tggatggtga ttttctcact	900
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gtctatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tattatatgc	1200
cctgccttgg agttcaccaa gaagttctca gaatggggaa ataatgcctt tttctactat	1260
tttgaacacc gatcctccaa acttccgtgg ccagaatgga tgggagtgat gcatggctat	1320
gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag	1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
aatgagactc agaacaatag cacaagctgg cctgtcttca aaagcactga acaaaaatat	1500
ctaaccctga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccatcgctgg aacaattaca tgatggactg gaaaaatcaa	1680
tttaacgatt aactagcaa gaaagaaagt tgtgtgggtc tc	1722

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 <211> 574  
 <212> PRT  
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<220>  
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<220>  
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 <222> (277)..(277)  
 <223> A277V

<220>  
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 <222> (285)..(285)  
 <223> P285L

x16700B\_US seq list revised Natl 12May2005.ST25.txt

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<221> VARIANT

<222> (398)..(398)

<223> F398I

<400> 190

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20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Gly Ser Phe Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Val Phe Val Val Pro Tyr Gly Thr Leu Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Ile Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

x16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 191  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 191  
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tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact 360  
ggaacatcat ctttacatgt ttatgatggc aagtttctgg ctcggttgga aagagttatt 420  
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag ctttggtgg aaatcctaaa agtgtaaact tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
attctgcaaa gtggttccgc kaatgtcct tgggcggtaa catctcttta tgaagctagg 720  
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatccccaa gaaattcttc tgaatgaagc atttgttgtc 840

X16700B\_US seq list revised Natl 12May2005.ST25.txt

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ccctatggga ctcctgggtc agtaaacctt ggtccgaccg tggatgggtga tttctcact    900
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gttaataaag atgaagggtc agctttttta gtctcgggtg ctcctgggtt cagcaaagat   1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga    1080
gtgagtgagt ttggaaggga atccatcctt tttcattaca cagactgggt agatgatcag    1140
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gaaattgaat ttgtcttttg tttacctctg gaaagaagag ataattacac aaaagccgag    1380
gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca    1440
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<210> 192
<211> 574
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
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<222> (227)..(227)
<223> Xaa = Ala

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<400> 192

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x16700B\_US seq list revised Natl 12May2005.ST25.txt

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Gly Ser Val

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
 290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
 305 310 315 320

Val Asn Lys Asp Gly Thr Ala Phe Leu Val Ser Gly Ala Pro Gly  
 325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
 340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
 355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
 370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
 385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
 405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
 420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
 435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
 450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
 465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
 485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
 500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
 515 520 525

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 193  
<211> 1722  
<212> DNA  
<213> Artificial

<220>  
<223> Synthetic butyrylcholinesterase variant

<400> 193  
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tttggtggca cggtaacagc ctttcttgga attccctatg cacagccacc tcttggtaga 120  
cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttgga tgccacaaaa 180  
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag 240  
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca 300  
gcacctaaac caaaaaatgc cactgtattg atatggattt atgggtgggtg ttttcaaact 360  
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gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct 480  
gaggctccag ggaacatggg tttatttgat caacagttgg ctcttcagtg ggttcaaaaa 540  
aatatagcag ctttggtgg aaatcctaaa agtgtaactc tctttggaga aagtgcagga 600  
gcagcttcag ttagcctgca tttgctttct cctggaagcc attcattgtt caccagagcc 660  
attctgcaaa gtggttccgc kaatgctcct tgggcggtaa catctcttta tgaagctagg 720  
aacagaacgt tgaacttagc taaattgact ggttgctcta gagagaatga gactgaaata 780  
atcaagtgtc ttagaaataa agatcccca gaaattcttc tgaatgaagc atttgttgtc 840  
ccctatggga ctctttgtc agtaaaactt ggtccgaccg tggatggtga ttttctcact 900  
gacatgccag acatattact tgaacttgga caatttaaaa aaaccagat tttggtgggt 960  
gttaataaag atgaaggac agctttttta gtctatggtg ctctgggtt cagcaaagat 1020  
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt tttccagga 1080  
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag 1140  
agacctgaaa actaccgtga ggccttgggt gatgttggtg gggattataa tttcatatgc 1200  
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X16700B\_US seq list revised Natl 12May2005.ST25.txt

tttgaacacc gatcctccaa acttctcttg ccagaatggg ttggagtgat gcatggctat	1320
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gaaattttga gtagatccat agtgaaacgg tgggcaaatt ttgcaaaata tgggaatcca	1440
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ctaaccttga atacagagtc aacaagaata atgacgaaac tacgtgctca acaatgtcga	1560
ttctggacat ctttttttcc aaaagtcttg gaaatgacag gaaatattga tgaagcagaa	1620
tgggagtgga aagcaggatt ccacgctgg aacaattaca tgatggactg gaaaaatcaa	1680
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<210> 194  
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 <212> PRT  
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<220>  
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 <223> Xaa = Ala

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 <222> (429)..(429)  
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 <222> (434)..(434)  
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Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
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Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
                   100                  105                  110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
                   115                  120                  125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
                   130                  135                  140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
                   145                  150                  155                  160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
                   165                  170                  175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
                   180                  185                  190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
                   195                  200                  205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
                   210                  215                  220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
                   225                  230                  235                  240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
                   245                  250                  255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
                   260                  265                  270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Pro Leu Ser Val  
                   275                  280                  285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
                   290                  295                  300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
                   305                  310                  315                  320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Val Tyr Gly Ala Pro Gly  
                   325                  330                  335

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Leu Trp Pro Glu  
420 425 430

Trp Val Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu Glu Met Thr Gly Asn Ile Asp Glu Ala Glu Trp Glu Trp Lys  
530 535 540

Ala Gly Phe His Arg Trp Asn Asn Tyr Met Met Asp Trp Lys Asn Gln  
545 550 555 560

Phe Asn Asp Tyr Thr Ser Lys Lys Glu Ser Cys Val Gly Leu  
565 570

<210> 195  
<211> 1722

X16700B\_US seq list revised Natl 12May2005.ST25.txt

<212> DNA

<213> Artificial

<220>

<223> Synthetic butyrylcholinesterase variant

<400> 195

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cttcgattca aaaagccaca gtctctgacc aagtgggtctg atatttggaa tgccacaaaa	180
tatgcaaatt cttgctgtca gaacatagat caaagttttc caggcttcca tggatcagag	240
atgtggaacc caaacactga cctcagtga gactgtttat atctaaatgt atggattcca	300
gcacctaaac caaaaaatgc cactgtattg atatggattt atggtggtgg ttttcaaact	360
ggaacatcat ctttacctgt ttatgatggc aagtttctgg ctcggttga aagagttatt	420
gtagtgtcaa tgaactatag ggtgggtgcc ctaggattct tagctttgcc aggaaatcct	480
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gacatgccag acatattact tgaacttga caatttaaaa aaaccagat tttggtgggt	960
gttaataaag atgaaggac agctttttta gcgtatggtg ctcttggtt cagcaaagat	1020
aacaatagta tcataactag aaaagaattt caggaagggt taaaaatatt ttttcagga	1080
gtgagtgagt ttggaaagga atccatcctt tttcattaca cagactgggt agatgatcag	1140
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x16700B\_US seq list revised Natl 12May2005.ST25.txt  
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1722

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 <223> P285N

<220>  
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<400> 196

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 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe His Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
 115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
 130 135 140

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys

Pro	Ala	Leu	Glu	Phe 405	Thr	Lys	Lys	Phe	Ser 410	Glu	Trp	Gly	Asn	Asn 415	Ala
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Trp	Met	Gly 435	Val	Met	His	Gly	Tyr 440	Glu	Ile	Glu	Phe	Val 445	Phe	Gly	Leu
Pro	Leu 450	Glu	Arg	Arg	Asp	Asn 455	Tyr	Thr	Lys	Ala	Glu 460	Glu	Ile	Leu	Ser
Arg 465	Ser	Ile	Val	Lys	Arg 470	Trp	Ala	Asn	Phe	Ala 475	Lys	Tyr	Gly	Asn	Pro 480
Asn	Glu	Thr	Gln	Asn 485	Asn	Ser	Thr	Ser	Trp 490	Pro	Val	Phe	Lys	Ser 495	Thr
Glu	Gln	Lys	Tyr 500	Leu	Thr	Leu	Asn	Thr 505	Glu	Ser	Thr	Arg	Ile 510	Met	Thr
Lys	Leu	Arg 515	Ala	Gln	Gln	Cys	Arg 520	Phe	Trp	Thr	Ser	Phe 525	Phe	Pro	Lys
Val	Leu 530	Glu	Met	Thr	Gly	Asn 535	Ile	Asp	Glu	Ala	Glu 540	Trp	Glu	Trp	Lys
Ala 545	Gly	Phe	His	Arg	Trp 550	Asn	Asn	Tyr	Met	Met 555	Asp	Trp	Lys	Asn	Gln 560
Phe	Asn	Asp	Tyr	Thr 565	Ser	Lys	Lys	Glu	Ser 570	Cys	Val	Gly	Leu		

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<220>
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<222> (1)..(642)
<223> Anti-CD20 antibody light chain
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60

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<210> 198
<211> 213
<212> PRT
<213> Artificial

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<220>
<223> Synthetic butyrylcholinesterase variant

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<220>
<221> MISC_FEATURE
<222> (1)..(213)
<223> Anti-CD20 antibody light chain

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<400> 198

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Glu Arg Ala Thr Leu Ser Cys Arg Ala Ser Ser Ser Val Pro Tyr Ile
20           25           30

```

```

His Trp Tyr Gln Gln Lys Pro Gly Gln Ala Pro Arg Leu Leu Ile Tyr
35           40           45

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Ala Thr Ser Ala Leu Ala Ser Gly Ile Pro Asp Arg Phe Ser Gly Ser
50           55           60

```

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Gly Ser Gly Thr Asp Phe Thr Leu Thr Ile Ser Arg Leu Glu Pro Glu
65           70           75           80

```

```

Asp Phe Ala Val Tyr Tyr Cys Gln Gln Trp Leu Ser Asn Pro Pro Thr
85           90           95

```

```

Phe Gly Gln Gly Thr Lys Leu Glu Ile Lys Arg Thr Val Ala Ala Pro
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 100 105 110

Ser Val Phe Ile Phe Pro Pro Ser Asp Glu Gln Leu Lys Ser Gly Thr  
 115 120 125

Ala Ser Val Val Cys Leu Leu Asn Asn Phe Tyr Pro Arg Glu Ala Lys  
 130 135 140

Val Gln Trp Lys Val Asp Asn Ala Leu Gln Ser Gly Asn Ser Gln Glu  
 145 150 155 160

Ser Val Thr Glu Gln Asp Ser Lys Asp Ser Thr Tyr Ser Leu Ser Ser  
 165 170 175

Thr Leu Thr Leu Ser Lys Ala Asp Tyr Glu Lys His Lys Val Tyr Ala  
 180 185 190

Cys Glu Val Thr His Gln Gly Leu Ser Ser Pro Val Thr Lys Ser Phe  
 195 200 205

Asn Arg Gly Glu Cys  
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<210> 199  
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 <212> DNA  
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<220>  
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<220>  
 <221> misc\_feature  
 <222> (1)..(2298)  
 <223> Anti-CD20 antibody VH-CH1 hinge cys L530 BChE.4-1 heavy chain construct

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 cccgggaaaag gcctggagtg gatgggggct atttatccct tgacgggtga tacttcctac 180  
 aatcagaagt cgaaactcca ggtcaccatc tcagccgaca agtccatcag caccgcctac 240  
 ctgcagtgga gcagcctgaa ggcctcggac accgccatgt attactgtgc gagatcgact 300  
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<210> 200  
<211> 765  
<212> PRT  
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<223> Synthetic butyrylcholinesterase variant  
  
<220>  
<221> MISC\_FEATURE  
<222> (1)..(765)  
<223> Anti-CD20 antibody VH-CH1 hinge cys L530 BChE.4-1 heavy chain construct  
  
<400> 200

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Ser Leu Lys Ile Ser Cys Lys Gly Ser Gly Arg Thr Phe Thr Ser Tyr  
20 25 30

Asn Met His Trp Val Arg Gln Met Pro Gly Lys Gly Leu Glu Trp Met  
35 40 45

Gly Ala Ile Tyr Pro Leu Thr Gly Asp Thr Ser Tyr Asn Gln Lys Ser  
50 55 60

Lys Leu Gln Val Thr Ile Ser Ala Asp Lys Ser Ile Ser Thr Ala Tyr  
65 70 75 80

Leu Gln Trp Ser Ser Leu Lys Ala Ser Asp Thr Ala Met Tyr Tyr Cys  
85 90 95

Ala Arg Ser Thr Tyr Val Gly Gly Asp Trp Gln Phe Asp Val Trp Gly  
100 105 110

Lys Gly Thr Thr Val Thr Val Ser Ser Ala Ser Thr Lys Gly Pro Ser  
115 120 125

Val Phe Pro Leu Ala Pro Ser Ser Lys Ser Thr Ser Gly Gly Thr Ala  
130 135 140

Ala Leu Gly Cys Leu Val Lys Asp Tyr Phe Pro Glu Pro Val Thr Val  
145 150 155 160

Ser Trp Asn Ser Gly Ala Leu Thr Ser Gly Val His Thr Phe Pro Ala  
165 170 175

Val Leu Gln Ser Ser Gly Leu Tyr Ser Leu Ser Ser Val Val Thr Val  
180 185 190

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Pro Ser Ser Ser Leu Gly Thr Gln Thr Tyr Ile Cys Asn Val Asn His  
195 200 205

Lys Pro Ser Asn Thr Lys Val Asp Lys Lys Ala Glu Pro Lys Ser Cys  
210 215 220

Asp Lys Thr His Thr Cys Pro Pro Cys Pro Lys Leu Glu Asp Asp Ile  
225 230 235 240

Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met Asn Leu Thr Val  
245 250 255

Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro Tyr Ala Gln Pro  
260 265 270

Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser Leu Thr Lys Trp  
275 280 285

Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser Cys Cys Gln Asn  
290 295 300

Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu Met Trp Asn Pro  
305 310 315 320

Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn Val Trp Ile Pro  
325 330 335

Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp Ile Tyr Gly Gly  
340 345 350

Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr Asp Gly Lys Phe  
355 360 365

Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met Asn Tyr Arg Val  
370 375 380

Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro Glu Ala Pro Gly  
385 390 395 400

Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln Trp Val Gln Lys  
405 410 415

Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val Thr Leu Phe Gly  
420 425 430

Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu Leu Ser Pro Gly

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 435 440 445

Ser<sup>450</sup> His Ser Leu Phe Thr Arg<sup>455</sup> Ala Ile Leu Gln Ser<sup>460</sup> Gly Ser Ala Asn  
 Ala<sup>465</sup> Pro Trp Ala Val Thr<sup>470</sup> Ser Leu Tyr Glu Ala<sup>475</sup> Arg Asn Arg Thr Leu<sup>480</sup>  
 Asn Leu Ala Lys Leu<sup>485</sup> Thr Gly Cys Ser Arg<sup>490</sup> Glu Asn Glu Thr Glu<sup>495</sup> Ile  
 Ile Lys Cys Leu<sup>500</sup> Arg Asn Lys Asp Pro<sup>505</sup> Gln Glu Ile Leu Leu<sup>510</sup> Asn Glu  
 Ala Phe Val<sup>515</sup> Val Pro Tyr Gly Thr<sup>520</sup> Asn Leu Ser Val Asn<sup>525</sup> Phe Gly Pro  
 Thr Val<sup>530</sup> Asp Gly Asp Phe Leu<sup>535</sup> Thr Asp Met Pro Asp<sup>540</sup> Ile Leu Leu Glu  
 Leu<sup>545</sup> Gly Gln Phe Lys Lys<sup>550</sup> Thr Gln Ile Leu Val<sup>555</sup> Gly Val Asn Lys Asp<sup>560</sup>  
 Glu Gly Thr Ala Phe<sup>565</sup> Leu Ala Tyr Gly Ala<sup>570</sup> Pro Gly Phe Ser Lys<sup>575</sup> Asp  
 Asn Asn Ser Ile<sup>580</sup> Ile Thr Arg Lys Glu<sup>585</sup> Phe Gln Glu Gly Leu<sup>590</sup> Lys Ile  
 Phe Phe Pro<sup>595</sup> Gly Val Ser Glu Phe<sup>600</sup> Gly Lys Glu Ser Ile<sup>605</sup> Leu Phe His  
 Tyr Thr<sup>610</sup> Asp Trp Val Asp Asp<sup>615</sup> Gln Arg Pro Glu Asn<sup>620</sup> Tyr Arg Glu Ala  
 Leu<sup>625</sup> Gly Asp Val Val Gly<sup>630</sup> Asp Tyr Asn Phe Ile<sup>635</sup> Cys Pro Ala Leu Glu<sup>640</sup>  
 Phe Thr Lys Lys Phe<sup>645</sup> Ser Glu Trp Gly Asn<sup>650</sup> Asn Ala Phe Phe Tyr<sup>655</sup> Tyr  
 Phe Glu His Arg<sup>660</sup> Ser Ser Lys Leu Pro<sup>665</sup> Trp Pro Glu Trp Met<sup>670</sup> Gly Val  
 Met His Gly<sup>675</sup> Tyr Glu Ile Glu Phe<sup>680</sup> Val Phe Gly Leu Pro<sup>685</sup> Leu Glu Arg

X16700B\_US seq list revised Natl 12May2005.ST25.txt  
 Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser Arg Ser Ile Val  
 690 695 700

Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro Asn Glu Thr Gln  
 705 710 715 720

Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr Glu Gln Lys Tyr  
 725 730 735

Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr Lys Leu Arg Ala  
 740 745 750

Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys Val  
 755 760 765

<210> 201  
 <211> 530  
 <212> PRT  
 <213> Artificial

<220>  
 <223> Synthetic butyrylcholinesterase variant

<220>  
 <221> MISC\_FEATURE  
 <222> (1)..(530)  
 <223> L530 construct

<400> 201

Glu Asp Asp Ile Ile Ile Ala Thr Lys Asn Gly Lys Val Arg Gly Met  
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Asn Leu Thr Val Phe Gly Gly Thr Val Thr Ala Phe Leu Gly Ile Pro  
 20 25 30

Tyr Ala Gln Pro Pro Leu Gly Arg Leu Arg Phe Lys Lys Pro Gln Ser  
 35 40 45

Leu Thr Lys Trp Ser Asp Ile Trp Asn Ala Thr Lys Tyr Ala Asn Ser  
 50 55 60

Cys Cys Gln Asn Ile Asp Gln Ser Phe Pro Gly Phe Phe Gly Ser Glu  
 65 70 75 80

Met Trp Asn Pro Asn Thr Asp Leu Ser Glu Asp Cys Leu Tyr Leu Asn  
 85 90 95

Val Trp Ile Pro Ala Pro Lys Pro Lys Asn Ala Thr Val Leu Ile Trp  
 100 105 110

X16700B\_US seq list revised Natl 12May2005.ST25.txt

Ile Tyr Gly Gly Gly Phe Gln Thr Gly Thr Ser Ser Leu His Val Tyr  
115 120 125

Asp Gly Lys Phe Leu Ala Arg Val Glu Arg Val Ile Val Val Ser Met  
130 135 140

Asn Tyr Arg Val Gly Ala Leu Gly Phe Leu Ala Leu Pro Gly Asn Pro  
145 150 155 160

Glu Ala Pro Gly Asn Met Gly Leu Phe Asp Gln Gln Leu Ala Leu Gln  
165 170 175

Trp Val Gln Lys Asn Ile Ala Ala Phe Gly Gly Asn Pro Lys Ser Val  
180 185 190

Thr Leu Phe Gly Glu Ser Ala Gly Ala Ala Ser Val Ser Leu His Leu  
195 200 205

Leu Ser Pro Gly Ser His Ser Leu Phe Thr Arg Ala Ile Leu Gln Ser  
210 215 220

Gly Ser Xaa Asn Ala Pro Trp Ala Val Thr Ser Leu Tyr Glu Ala Arg  
225 230 235 240

Asn Arg Thr Leu Asn Leu Ala Lys Leu Thr Gly Cys Ser Arg Glu Asn  
245 250 255

Glu Thr Glu Ile Ile Lys Cys Leu Arg Asn Lys Asp Pro Gln Glu Ile  
260 265 270

Leu Leu Asn Glu Ala Phe Val Val Pro Tyr Gly Thr Asn Leu Ser Val  
275 280 285

Asn Phe Gly Pro Thr Val Asp Gly Asp Phe Leu Thr Asp Met Pro Asp  
290 295 300

Ile Leu Leu Glu Leu Gly Gln Phe Lys Lys Thr Gln Ile Leu Val Gly  
305 310 315 320

Val Asn Lys Asp Glu Gly Thr Ala Phe Leu Ala Tyr Gly Ala Pro Gly  
325 330 335

Phe Ser Lys Asp Asn Asn Ser Ile Ile Thr Arg Lys Glu Phe Gln Glu  
340 345 350

Gly Leu Lys Ile Phe Phe Pro Gly Val Ser Glu Phe Gly Lys Glu Ser  
355 360 365

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Ile Leu Phe His Tyr Thr Asp Trp Val Asp Asp Gln Arg Pro Glu Asn  
370 375 380

Tyr Arg Glu Ala Leu Gly Asp Val Val Gly Asp Tyr Asn Phe Ile Cys  
385 390 395 400

Pro Ala Leu Glu Phe Thr Lys Lys Phe Ser Glu Trp Gly Asn Asn Ala  
405 410 415

Phe Phe Tyr Tyr Phe Glu His Arg Ser Ser Lys Leu Pro Trp Pro Glu  
420 425 430

Trp Met Gly Val Met His Gly Tyr Glu Ile Glu Phe Val Phe Gly Leu  
435 440 445

Pro Leu Glu Arg Arg Asp Asn Tyr Thr Lys Ala Glu Glu Ile Leu Ser  
450 455 460

Arg Ser Ile Val Lys Arg Trp Ala Asn Phe Ala Lys Tyr Gly Asn Pro  
465 470 475 480

Asn Glu Thr Gln Asn Asn Ser Thr Ser Trp Pro Val Phe Lys Ser Thr  
485 490 495

Glu Gln Lys Tyr Leu Thr Leu Asn Thr Glu Ser Thr Arg Ile Met Thr  
500 505 510

Lys Leu Arg Ala Gln Gln Cys Arg Phe Trp Thr Ser Phe Phe Pro Lys  
515 520 525

Val Leu  
530